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First Airborne Laser aircraft arrives in Wichita

by Rich Garcia, Directed Energy Directorate

KIRTLAND AFB, N.M. — A wide-bodied aircraft, which will soon be the world's first laser-armed aircraft, arrived in Wichita, Kan., from Seattle, Wash., recently to begin major modifications.

Over the next several months, this Airborne Laser — a Boeing 747-400 freighter aircraft — will undergo changes at the Boeing facility here. The most noticeable difference will be installation of a turret in the aircraft nose, from which a beam of laser light will emanate to destroy Scud-like missiles hundreds of miles away.

Additionally, the aircraft will be modified to accept a multi-megawatt-class chemical laser, specialized optics and the computerized equipment that will allow the aircraft to spot a theater ballistic missile shortly after launch, lock onto and destroy it.

Designated the YAL-1A Attack Laser, it rolled off the Boeing assembly line in December. Under the current plan, testing in this phase of the program culminates in 2003, with the planned destruction of several theater ballistic missiles.

BECOMING A REALITY — Pictured is the first aircraft to be equipped with the Airborne Laser, a technology that would allow the aircraft to destroy Scud-like missiles in mid-air. The Air Force plans to have a fleet of the aircraft available to deploy to missions around the globe by 2009.

A seven-plane operational fleet could exist as early as 2009. The Airborne Laser System Program office is responsible for producing the YAL-1A. The office formed in 1993 at Kirtland AFB, N.M., and is a major unit of Air Force Space and Missile Systems Center, Los Angeles AFB, Calif.

Several key contractors are working under a $1.3-billion contract, and are instrumental in producing the YAL-1A. The initial cost-plus contract was awarded by the Air Force in November 1996, to Boeing Defense Group of Seattle.

Boeing will build the aircraft, manage systems integration, aircraft modifications, and develop battle management systems — computers and software coupled to communications, intelligence and weapons-related instrumentation to detect, engage and defeat the attacking missiles.

Working with Boeing are two other contractors: TRW Space and Electronics Group of Redondo Beach, Calif., is developing the laser, and Lockheed Martin Missiles and Space of Sunnyvale, Calif., is in charge of beam- and fire-control development.

Another key organization is Air Force Research Laboratory's Directed Energy Directorate, also at Kirtland. For more than 20 years, the laboratory has been conducting research into technologies needed to make a defensive laser-carrying aircraft a reality. This includes invention of chemical oxygen-iodine laser that will be used on the YAL-1A and development of technologies to increase the distance laser light can travel through the atmosphere to destroy attacking missiles.

The $1.3-billion award, termed the Airborne Laser Program Definition and Risk Reduction contract, culminated a two-year concept definition phase in which Boeing competed with Rockwell International. Under contracts for $22 million each, the two companies defined their concepts for a high-energy airborne laser system.

A key element in success of the aircraft is the system's ability to sense and compensate for distorting atmosphere

effects. To determine the impact of atmospheric effects, a series of experiments were conducted in 1994 and 1995. These tests involved a laser being fired from one plane to another. Specialized instrumentation received and measured the laser beam, identifying what the atmosphere would do to that beam traveling in a level (horizontal) path.

Additional testing has been at the North Oscura Peak site in the northern portion of White Sands Missile Range, N.M. This testing involved ranges and conditions that closely reflect operational situations.

In addition to understanding what the atmosphere could do to a laser beam, technologies were needed that could correct for those atmospheric distortions. Scientists at AFRL and Massachusetts Institute of Technology's Lincoln Laboratory worked out of astronomical facilities at Starfire Optical Range in the southeastern corner of Kirtland.

These researchers developed a system that uses lasers and computers to determine where distortions are. The computers then manage deformable optics: a mirror whose face can be altered hundreds of times per second to help compensate for distortions in the atmosphere.

For the attack laser, this technology offers a way to increase range of the laser beam through the air to destroy theater ballistic missiles. In actual battle, an airborne laser fleet could arrive on the scene within hours, ready to take defensive positions.

Two attack lasers would be flying around the clock, orbiting at about 40,000 feet, providing defense against attacking missiles. If the enemy were to launch a theater ballistic missile, Attack Laser would detect the booster while it is still powered as it emerges through the clouds. The attack laser would then destroy the missile, with resulting debris falling back on enemy territory. **@**